# INDOOR AIR QUALITY REASSESSMENT

**Amesbury Town Hall**
**86 Friend Street**
**Amesbury, Massachusetts**


Prepared by:
Massachusetts Department of Public Health
Bureau of Environmental Health Assessment
Emergency Response/Indoor Air Quality Program
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## Background/Introduction

At the request of the Amesbury Board of Health, the Massachusetts Department of Public Health (MDPH), the Bureau of Environmental Health Assessment (BEHA) was asked to conduct a reassessment of the indoor air quality issues and health concerns at the Amesbury Town Hall, 86 Friend Street, Amesbury, Massachusetts. On September 19, 2002, a visit was made to this building by Cory Holmes of BEHA's Emergency Response/Indoor Air Quality (ER/IAQ) Program, to conduct the reassessment.

## Actions on Recommendations Previously Made by MDPH

BEHA staff had previously visited the building in May 2001 and issued a report that made recommendations to improve indoor air quality (MDPH, 2001). A summary of actions taken on previous recommendations is included as Appendix I of this reassessment.

## Methods

Air tests for carbon dioxide, temperature and relative humidity were taken with the TSI, Q-Trak, IAQ Monitor, Model 8551.

## Results

Amesbury Town Hall has an employee population of approximately 25 and is visited by approximately 50-100 members of the public daily. Tests were taken under normal operating conditions. Test results appear in Tables 1-2.

## Discussion

### Ventilation

It can be seen from the tables that carbon dioxide levels were below 800 parts per million of air (ppm) in all areas surveyed, indicating adequate air exchange. Please note a number of areas were sparsely populated or had open windows, which can reduce carbon dioxide levels. Office space does not have mechanical ventilation. Each room has a radiator beneath the window, which provides heat. The sole source of fresh air in work areas are openable windows.

BEHA staff however, noted several unit ventilators (univents) located on the exterior walls of the meeting room (see Picture 1), which appeared to have not been activated for some time. Univents draw air from outdoors through a fresh air intake located on the exterior walls of the building (see Picture 2) and return air through an air intake located at the base of each unit (see Figure 1). Fresh air and return air are mixed, filtered, heated and provided through a fresh air diffuser located in the top of the unit. In order for univents to provide fresh air as designed, they must be activated and allowed to operate. Airflow is controlled by a toggle switch located on the front of the unit behind an access panel (see Picture 3). In subsequent conversation with local health officials, a plumbing contractor was reportedly contacted to determine the operability of the univents.

The Massachusetts Building Code requires a minimum ventilation rate of 20 cubic feet per minute (cfm) per occupant of fresh outside air or have openable windows in each room (SBBRS, 1997; BOCA, 1993). The ventilation must be on at all times that the room is occupied. Providing adequate fresh air ventilation with open windows and

maintaining the temperature in the comfort range during the cold weather season is impractical. Mechanical ventilation is usually required to provide adequate fresh air ventilation.

Carbon dioxide is not a problem in and of itself. It is used as an indicator of the adequacy of the fresh air ventilation. As carbon dioxide levels rise, it indicates that the ventilating system is malfunctioning or the design occupancy of the room is being exceeded. When this happens a buildup of common indoor air pollutants can occur, leading to discomfort or health complaints. The Occupational Safety and Health Administration (OSHA) standard for carbon dioxide is 5,000 parts per million parts of air (ppm). Workers may be exposed to this level for 40 hours/week, based on a time-weighted average (OSHA, 1997).

The Department of Public Health uses a guideline of 800 ppm for publicly occupied buildings. A guideline of 600 ppm or less is preferred in schools due to the fact that the majority of occupants are young and considered to be a more sensitive population in the evaluation of environmental health status. Inadequate ventilation and/or elevated temperatures are major causes of complaints such as respiratory, eye, nose and throat irritation, lethargy and headaches. For more information on carbon dioxide see Appendix II of this assessment.

Temperature readings were measured in a range of 72$^{o}$ F to 80$^{o}$ F, which was above or close to the higher end of the BEHA recommended comfort range. The BEHA recommends that indoor air temperatures be maintained in a range of 70$^{o}$ F to 78$^{o}$ F in order to provide for the comfort of building occupants. In many cases concerning indoor air quality, fluctuations of temperature in occupied spaces are typically

experienced, even in a building with an adequate fresh air supply. As expressed in the previous BEHA assessment, temperature is often difficult in an old building without a mechanical ventilation system.

The relative humidity in the building was within the BEHA recommended comfort range of 40 to 60 percent in all areas surveyed the day of the assessment. Relative humidity measurements ranged from 47 to 63 percent. During the heating season, relative humidity levels would be expected to drop below the recommended comfort range. The sensation of dryness and irritation is common in a low relative humidity environment. For buildings in New England, periods of low relative humidity during the winter are often unavoidable.

Of note is the level of relative humidity measurements in several areas (see Tables), which were up to 17 percent higher than the outdoor relative humidity measured during the assessment (46 percent). The relative humidity measurements indicate that a moisture source exists in the basement that is independent of occupancy. In addition, the lack of mechanical exhaust ventilation can allow excess moisture to accumulate within the building. While temperature is mainly a comfort issue, relative humidity in excess of 70 percent can provide an environment for mold and fungal growth (ASHRAE, 1989).

**Mold/Microbial Growth**

A leaking pipe was observed in the basement men's restroom (see Picture 4). Water damaged ceiling plaster was also noted around this area. If porous materials are allowed to remain moistened for an extended period of time, mold growth may occur. The American Conference of Governmental Industrial Hygienists (ACGIH) recommends

that porous materials be dried with fans and heating within 24 hours of becoming wet (ACGIH, 1989). If porous materials are not dried within this time frame, mold growth may occur. Water-damaged porous materials cannot be adequately cleaned to remove mold growth. The application of a mildewcide to moldy materials is not recommended.

**Other Concerns**

Dehumidifiers were being used in the basement and air purifiers were in use in office spaces. These types of equipment are usually equipped with filters that should be changed as per the manufacture's instructions. The filter for the dehumidifier in the basement was occluded with dust and debris (see Picture 5), which can become reaerosolized with operation.

Another potential source of irritants is the use of different cleaning products (see Picture 6). Several types of cleaning products were observed in various areas. These products contain volatile organic compounds (VOCs) or other materials that can be irritating to the eyes, nose and throat. Exacerbating odors from the use of these materials is the lack of mechanical ventilation within the building.

Musty odors were reported in the town clerk's office. The origin of these odors was a cabinet at floor level (see Picture 7). BEHA staff examined the interior of the cabinet and found an open floor hole leading to the basement covered with cardboard (see Picture 8). Open floor and/or utility holes can provide pathways for the movement of drafts, dusts and particulate matter between rooms and floors.

## Conclusions/Recommendations

Building management and maintenance staff, working in conjunction with Amesbury Town Hall personnel have improved indoor air quality conditions in the building by implementing many of the BEHA's previous recommendations. In view of the findings at the time of this visit, the following additional recommendations are made to further improve indoor air quality:

1. Continue to implement recommendations made in the previous BEHA report (MDPH, 2001).
2. Repair leaking pipe in basement restroom. Replace any water damaged building materials. Examine the area above and around these areas for mold growth. Disinfect areas of water leaks with an appropriate antimicrobial.
3. Clean change filters for air purifiers, window mounted air conditioners and dehumidifiers as per the manufacture's instructions or more frequently if needed.
4. Continue with plans to hire a plumbing or heating contractor to examine abandoned univents in auditorium for function. If operable, operate units during periods of building occupancy. Examine units to determine if they are equipped for filtration. If so, change filters on a regular schedule (e.g. 2-4 times per year).
5. Avoid using custodial cleaners containing VOCs. Acquire current Material Safety Data Sheets for all products that contain hazardous materials and are used within the building, including office supplies, in conformance with the Massachusetts Right-To-Know Law, M.G.L. c. 111F (MGL, 1983).

6. Seal hole beneath cabinet in Town Clerk's office and any other utility holes (see Tables) to prevent the migration of basement odors.

## References

ACGIH. 1998. American Conference of Governmental Industrial Hygienists. Industrial Ventilation A manual of Recommended Practice. 23rd Edition. 1998.

ASHRAE. 1989. Ventilation for Acceptable Indoor Air Quality. American Society of Heating, Refrigeration and Air Conditioning Engineers. ANSI/ASHRAE 62-1989.

BOCA. 1993. The BOCA National Mechanical Code-1993. 8th ed. Building Officials & Code Administrators International, Inc., Country Club Hills, IL. M-308.1

MDPH. 2001. Indoor Air Quality Assessment, Amesbury Town Hall, Amesbury, MA. Massachusetts Department of Public Health, Bureau of Environmental Health Assessment, Boston, MA. July 2001.

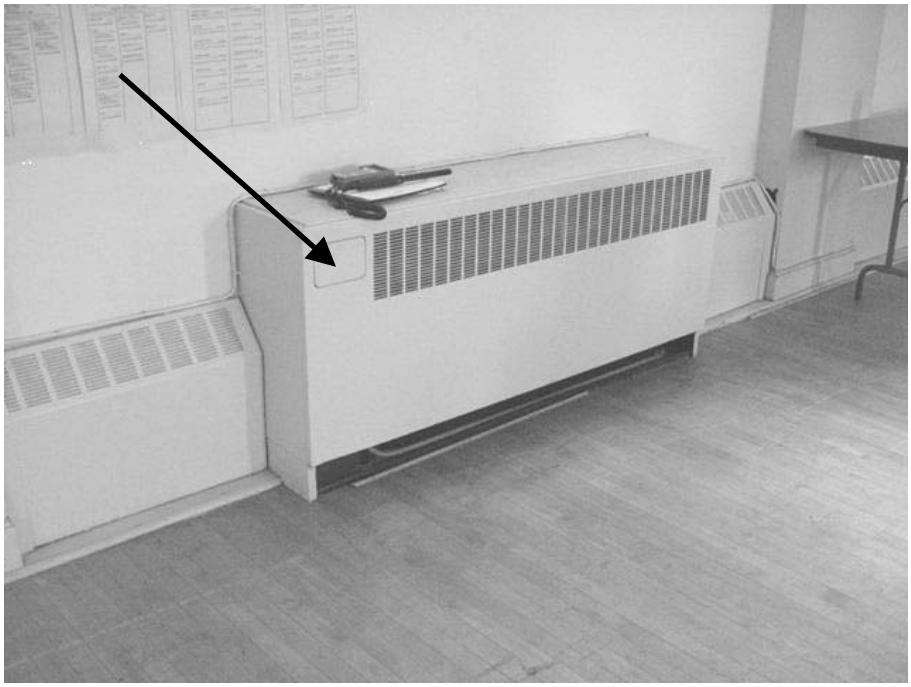
MGL. 1983. Hazardous Substances Disclosure by Employers. Massachusetts General Laws. M.G.L. c. 111F.

OSHA. 1997. Limits for Air Contaminants. Occupational Safety and Health Administration. Code of Federal Regulations. 29 C.F.R. 1910.1000 Table Z-1-A.

SBBRS. 1997. Mechanical Ventilation. State Board of Building Regulations and Standards. Code of Massachusetts Regulations. 780 CMR 1209.0

**Picture 1**

**Access Panel**

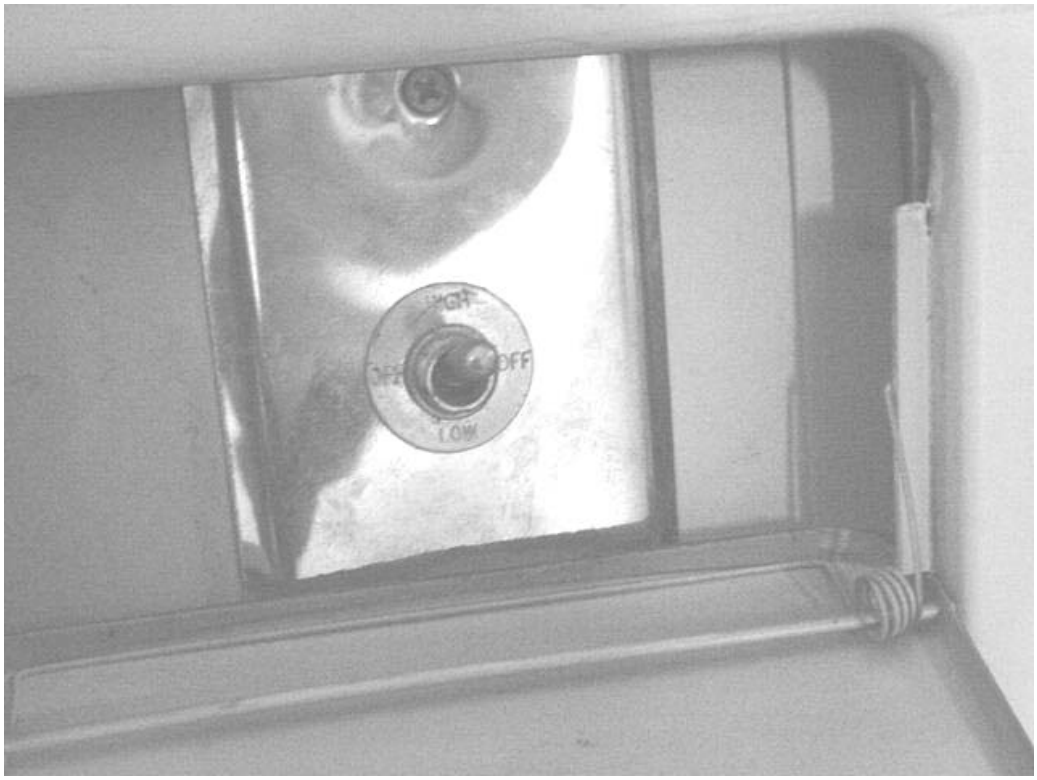


**Abandoned Unit Ventilator in Auditorium (One of Two)**

**Picture 2**

**Univent Fresh Air Intake on Exterior Wall of Building**

**Picture 3**




**Toggle Switch Controlling Univent Airflow**

**Picture 4**

**Leaking Pipe and Water Damaged Ceiling Plaster in Basement Restroom**

**Picture 5**


**Dehumidifier Filter Saturated With Dust and Debris**

**Picture 6**


**Clean Products/Solvents in the Community & Economic Development/Planning Office**

**Picture 7**

**Abandoned Sink Cabinet Door in Town Clerk's Office**

**Picture 8**

**Open Hole to Basement in Cabinet Shown in Preceding Picture**

**TABLE 1**

## Indoor Air Test Results – Amesbury Town Hall, 86 Friend Street, Amesbury, MA – September 19, 2002

| Location | Carbon Dioxide *ppm | Temp. °F | Relative Humidity % | Occupants in Room | Windows Openable | Ventilation | | Remarks |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Intake | Exhaust | |
| Outside (Background) | 448 | 76 | 46 | | | | | Weather Conditions: clear, sunshine, breezy |
| Auditorium | 500 | 73 | 52 | 3 | Yes | Yes | No | Exterior door open, ceiling fans-on, four univents-deactivated, no response from toggle switch |
| Assessors Office | 643 | 75 | 47 | 1 | Yes | | | Carpets removed-linoleum |
| Assessors Main Area | 689 | 75 | 53 | 3 | Yes | No | No | Window mounted A/C ducted to office, transom, door open, utility hole near radiator (wall) |
| Town Clerk | 688 | 68 | 43 | 0 | No | No | No | Holes in floor |
| Administration & Finance Reception | 694 | 77 | 46 | 3 | Yes | No | Yes | |
| A & F Office | 690 | 76 | 46 | 0 | Yes | No | No | Wall AC |
| Accounting Office | 659 | 79 | 48 | 2 | Yes | No | No | Window open, window AC |
| Accounting | 648 | 80 | 49 | 2 | Yes | No | No | Window AC |
| Left Stairwell Main Entrance | | | | | | | | Utility holes |

*** ppm = parts per million parts of air**

**Comfort Guidelines** **CT = ceiling tiles**

| | |
|---|---|
| Carbon Dioxide - | < 600 ppm = preferred |
| | 600 - 800 ppm = acceptable |
| | > 800 ppm = indicative of ventilation problems |
| Temperature - | 70 - 78 °F |
| Relative Humidity - | 40 - 60% |

**TABLE 2**

## Indoor Air Test Results – Amesbury Town Hall, 86 Friend Street, Amesbury, MA – September 19, 2002

| Location | Carbon Dioxide *ppm | Temp. °F | Relative Humidity % | Occupants in Room | Windows Openable | Ventilation | | Remarks |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Intake | Exhaust | |
| Town Clerk | 705 | 77 | 48 | 1 | Yes | No | No | Window open, reports of musty odor from under sink cabinet-open utility hole |
| Tax Collector | 588 | 77 | 49 | 2 | Yes | No | No | Window AC |
| Treasurer's Office | 571 | 77 | 49 | 0 | Yes | No | No | |
| Basement | 657 | 73 | 55 | 0 | Yes | No | No | Dehumidifier & HEPA filters, Light penetration through underside of metal stairs |
| Basement Restroom | | | | | | | | Slow leak ceiling pipes, moistened ceiling plaster |
| Copy Room | 638 | 72 | 63 | 0 | No | No | No | Cleaning products, photocopiers & other office equipment |
| Community & Economic Development Planning - (CED) | 632 | 72 | 56 | 0 | Yes | No | No | Window open, HEPA Filter |
| CED – Director | 717 | 77 | 54 | 3 | No | No | No | Wall mounted A/C |
| Engineering | 553 | 77 | 47 | 0 | No | No | No | Two blueprint machines, no local exhaust |

*** ppm = parts per million parts of air**

**CT = ceiling tiles**

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Temperature - 70 - 78 °F

Relative Humidity - 40 - 60%